Effects of novel Rehabilitation device on Gait and Balance control of stroke survivors

Naama Mizrachi[1], Iuly Treger[2] , Itzik Melzer[1]

[1] Recanati School for Community Health Professions, Movement Analysis & Rehabilitation Laboratory, Ben-Gurion University of the Negev.

[2] Rehabilitation Department, Soroka University Medical Center, Israel. Department of Medicine, Faculty for Health Sciences, BGU, Israel

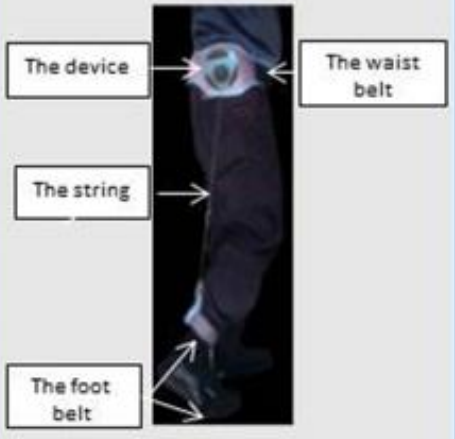
Introduction

Stroke is a leading cause for disability in Israel, as in many countries worldwide. Over 50% of stroke survivors will suffer from moderate to severe gait dysfunction. Stroke survivors are at high risk for falls during gait due to balance and gait deficits, i.e., decrease in walking speed and step asymmetries. Motor adaptation in response to perturbation during walking may improve those deficits temporarily.

Materials and Methods

Twenty-five PwS volunteered to a laboratory pre-post pilot study. participants undergo a series of tests: the Tinetti's Performance Oriented Measure Assessment (POMA), the two-minute walk test (2MWT) and postural stability assessment. One week after the first series of tests each subject participate in a single 30-minute physical therapy treatment using the 'just walk' device.

Figure 1: the 'just walk' device



The device provides resistance to the limb in a way that the resistance is proportional to the movement velocity of the limb. The device is attached to a belt around the subject waist at the side of the leg having the shorter step length. A string is connecting the device to a belt around the foot. A system of metal disc and magnets around it provide resistance to the moving limb through the string proportional to movement velocity. (Figure 1). Immediately following training PwS undergo second series of tests.

objectives

to investigate a novel rehabilitation device, the 'just walk' device, that provides perturbation to the leg during walking and proprioceptive stimuli, to improve gait function and balance control in people with stroke (PwS).

Results

A single treatment using the 'just walk' device improved both gait and balance scores in the POMA ($p < 0.05$, median score improved from 12 to 12.5, 8.5 to 9 and 20.5 to 22 in balance, gait and total scores respectively). A trend toward improvement observed in the 2MWT ($p<0.1$). However, no improvement, was found in the traditional postural sway measures of foot center-of-pressure (CoP) displacements and fractal measures, the Stabilogram-Diffusion Analysis (SDA).

Figure 2: POMA score pre vs. post intervention

Conclusions

The 'just walk' device was able to improve gait function temporarily in PwS, especially in balance and gait performance. This could be due to error-based learning-mechanism and adaptation of the motor system. Postural sway in quiet standing was not improved, highlighting the fact that the 'just walk' device treat specifically dynamic gait and not "static balance".

References

Helm, E. E., & Reisman, D. S. (2015). The split-belt walking paradigm: Exploring motor learning and spatiotemporal asymmetry post stroke. *Physical Medicine and Rehabilitation Clinics of North America*.

Savin, D. N., Morton, S. M., & Whitall, J. (2014). Generalization of improved step length symmetry from treadmill to over ground walking in persons with stroke and hemiparesis. *Clinical Neurophysiology*